CHI MEI OPTOELECTRONICS CORP.

Issued Date: Dec.17, 2007
Model No.: V562D1-L03
Approval

TFT LCD Approval Specification

MODEL NO.: V562D1 - L03

Customer: _____

Approved by: _____

Note:

Approved By	TV Head Division
	LY Chen

Reviewed By	QRA Dept.	Product Development Div.
	Tomy Chen	WT Lin

Prepared By	LCD TV Marketing and Product Management Div.
	Henry Teng

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REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 2.0	May. 7,'07	All	All	Approval Specification is first issued.
Ver 2.1	Jul.25,'07	5	1.5	Modify the value of Horizontal(H) and Vertical(V).
		13	4.2.3	Add Note (5).
		15	5.1	Modify CN1:S14B-PH-SM4-TB(D)(LF). Modify CN2:S12B-PH-SM4-TB(D)(LF).
		21	6.4	Modify CN1:S14B-PH-SM4-TB(D)(LF). Modify CN2:S12B-PH-SM4-TB(D)(LF).
		28	7.1	Input signal timing specifications add Max. timing spec.
		31	8.2	Modify Center Luminance of White to Typ.=450 nits and Min.=400 nits.
		39	12	Add screw hole section drawing.
Ver 2.2	Sep.25,'07	6	2.1	Modify Max. of Operating Ambient Temperature to 45 ºC.
		6	2.1	Modify Note (2) Surface temperature of display area should be less than or equal to 70 ºC.
		11	4.2.1	Modify the value of Lamp Current.
		11	4.2.2	Modify the value of Power Consumption and Power Supply Current.
		11	4.2.2	Modify Note (4) I_L = 5.5 ~ 6.5mA rms.
		11	4.2.2	Modify Note (6) average lamp current 6.3mA.
		31	8.1	Modify the value of Lamp Current.
		31	8.2	Modify Cross Talk from 4% to 2%.
		33	8.2	Modify Note (5).
		34	8.2	Modify Note (7).
Ver 2.3	Dec.17,'07	4	1.2	Add "Contrasty Image (Gamma 2.5)" description.
		40	12	Add two sensor holes. (For panels after (including) C2 version.)
		41	12	Add two sensor holes. (For panels after (including) C2 version.)

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V562D1-L03 is a 56" Thin-Film-Transistor Liquid-Crystal (TFT-LCD) module with one 32-CCFL backlight unit and 8ch-LVDS interface utilization. This module supports 3840 x 2160 Quad Full High Definition (QFHD) TV format and can display 16.7M colors (8-bit). The inverter module for backlight is also built-in.

1.2 FEATURES

- Ultra Wide Viewing Angle (176(H)/ 176(V) for CR>30)
- High Brightness (450 nits)
- High Contrast Ratio (1200:1)
- Ultra Fast Response Time (Gray to gray average 6.5 ms)
- High Color Saturation (NTSC 75%)
- Contrasty Image (Gamma 2.5)
- QFHD (3840 x 2160 pixels) Resolution
- 8ch-LVDS (Low Voltage Differential Signaling) Interface
- RoHS Compliance

1.3 APPLICATION

- Luxurious Living Room TVs
- Public Display
- Home Theater
- Satellite Communication
- Medical Analyses/ Instruction
- Security and Monitoring
- Industrial Design
- 3D Display
- Digital Museum
- Multi-Media Display

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	1244.16 (H) x 699.84 (V) (56.2" diagonal)	mm	
Bezel Opening Area	1252.1 (H) x 707.8 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	3840x R.G.B. x 2160	pixel	-
Pixel Pitch(Sub Pixel)	0.108 (H) x 0.324 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.7M	color	-
Display Operation Mode	Transmissive mode / Normally black	-	-
Surface Treatment	Hard coating 3H Low reflection coating< 2% reflection	-	(1)

Note (1) The specifications of the surface treatment are temporarily for this phase. CMO reserves the rights to change this feature.

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	1309	1309.5	1310.2	mm	
	Vertical(V)	766.5	767	767.7	mm	
	Depth(D)	57.2	58.5	59.8	mm	To PCB cover
	Depth(D)	61.9	63.2	64.5	mm	To inverter cover
Weight		23000	23500	24000	g	

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol		Value		Unit	Note
			Min.	Max.		
Storage Temperature	T_{ST}		-20	+55	ºC	(1)
Operating Ambient Temperature	T_{OP}		0	45	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	X, Y axis	-	30	G	(3), (5)
		Z axis	-	30	G	(3), (5)
Vibration (Non-Operating)	V_{NOP}		-	1.0	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

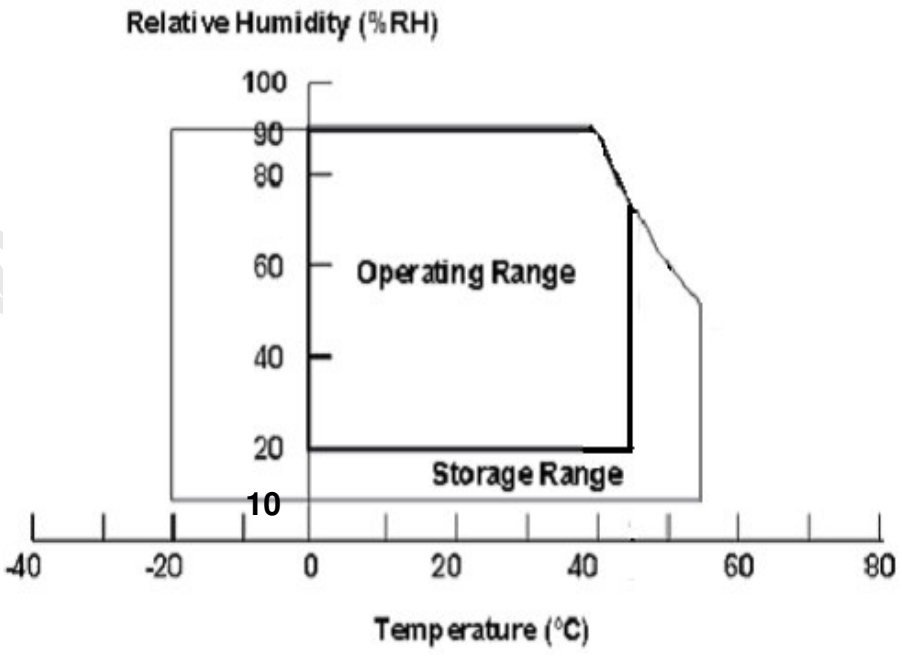
(c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 70 ºC with LCD module alone in a temperature controlled chamber. Thermal management should be considered in your product design to prevent the surface temperature of display area from being over 70 ºC. The range of operating temperature may degrade in case of improper thermal management in your product design.

Note (3) 11 ms, half sine wave, 1 time for ± X, ± Y, and ± Z.

Note (4) 10 ~ 200 Hz, 10 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture. The module would not be twisted or bent by the fixture.



2.2 RATINGS OF IMAGE STICKING

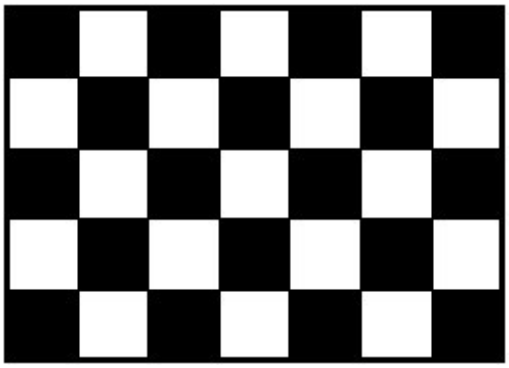
Item	Symbol	Value	Unit	Note
Room Temperature Image Sticking	RT IS	Invisibility	6% ND (%)	(1)(3)
High Temperature Image Sticking	HT IS	Invisibility	6% ND (%)	(2)(3)

Note (1) Room temperature image sticking test is at 25±3oC environment and fix the pattern A (checker pattern) for 12 hours.

Note (2) High temperature image sticking test is at 50±3oC environment and fix the pattern A for 12 hours.

Note (3) Inspection condition is at pattern B (128grade) after 5 mins from pattern A.

A. Pattern A (checker pattern)



B. Pattern B (128grade)

3. ELECTRICAL MAXIMUM RATINGS

3.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V_{CC1}	-0.3	20	V	(1)
	V_{CC2}	-0.3	6	V	
Logic Input Voltage	V_{IN}	-0.3	3.6	V	

Note: (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under normal operating conditions.

3.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V_W	—	5000	V_{RMS}	
Power Supply Voltage	V_{BL}	0	30	V	(1)
Control Signal Level	—	-0.3	7	V	(2), (3)

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) No moisture condensation or freezing.

Note (3) The control signals include On/Off Control, Internal PWM Control, External PWM Control and Internal/External PWM Selection.

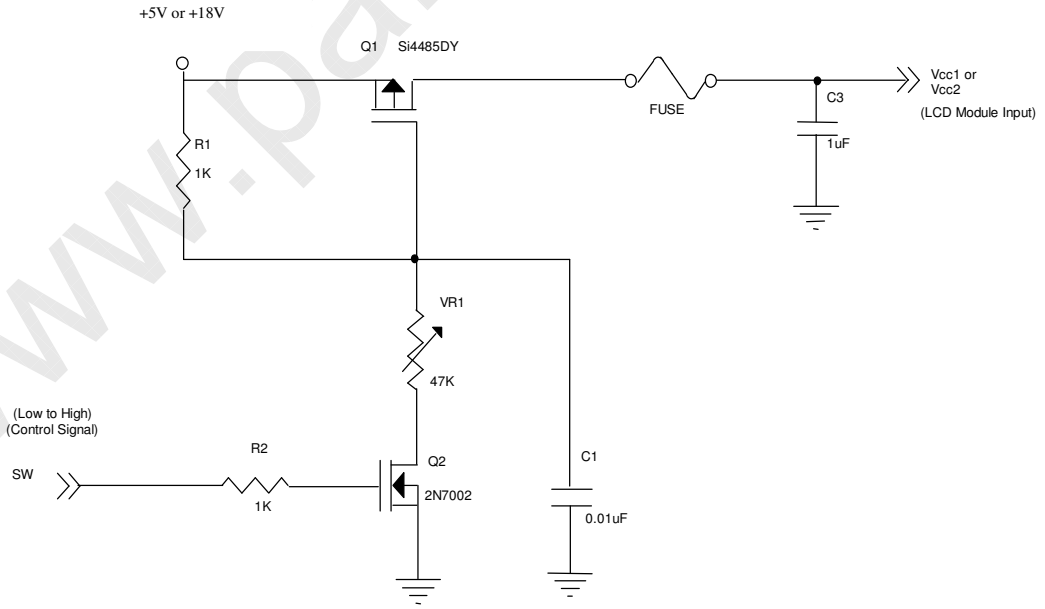
4. ELECTRICAL CHARACTERISTICS

4.1 TFT LCD MODULE

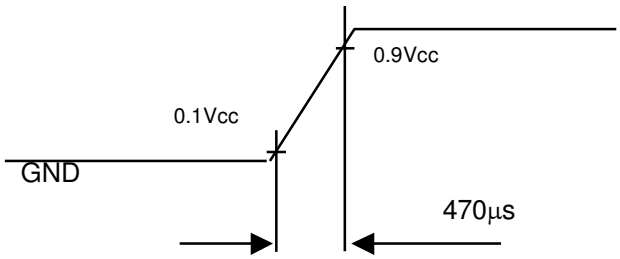
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC1}	17.1	18	18.9	V	(1)
		V_{CC2}	4.5	5	5.5	V	
Power Supply Ripple Voltage		V_{RP1}	-	-	400	mV	
		V_{RP2}			200	mV	
Rush Current		I_{RUSH1}	-	-	4.5	A	(2)
		I_{RUSH2}	-	-	9.5	A	
Power Supply Current	White	I_{CC1}	-	1.8	2.4	A	(3)
	Black		-	0.7	-	A	
	Vertical Stripe		-	1.4	-	A	
	White	I_{CC2}	-	2.8	-	A	
	Black		-	2.3	-	A	
	Vertical Stripe		-	2.5	3.2	A	
	V-Stripe-2column			3.4	4.4	A	
LVDS Interface	Differential Input High Threshold Voltage	V_{LVTH}	-	-	+100	mV	
	Differential Input Low Threshold Voltage	V_{LVTL}	-100	-		mV	
	Common Input Voltage	V_{LVC}	1.125	1.25	1.375	V	
	Terminating Resistor	R_T		100		ohm	
CMOS Interface	Input High Threshold Voltage	V_{IH}	2.7	-	3.3	V	
	Input Low Threshold Voltage	V_{IL}	0	-	0.7	V	

Note: (1)The module should be always operated within the above ranges.

(2) Measurement conditions:



Vcc rising time is at least 470μs



(3)The specified power supply current is under the conditions at Vcc1 = 18 V, Vcc2 = 5 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

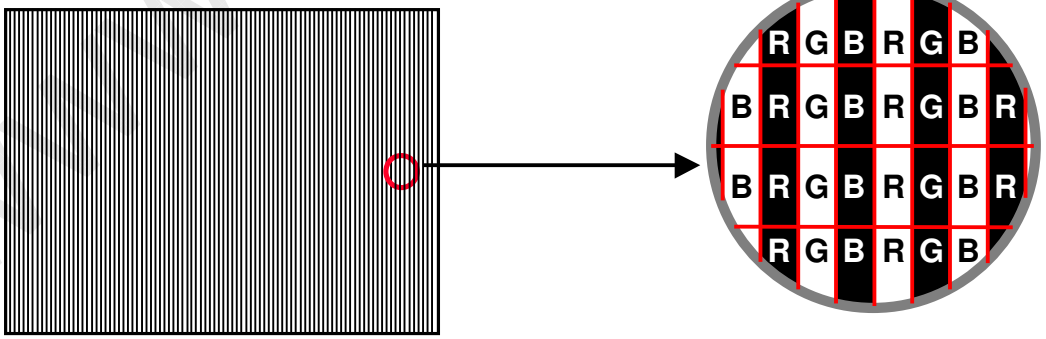
a. White Pattern

Active Area

b. Black Pattern

Active Area

c. Vertical Stripe Pattern



Active Area

4.2 BACKLIGHT UNIT

4.2.1 CCFL (Cold Cathode Fluorescent Lamp) CHARACTERISTICS (Ta=25±2℃)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Voltage	V_W	-	1728	-	V_{RMS}	I_L =5.7mA
Lamp Current	I_L	5.5	6.0	6.5	mA_{RMS}	(1)
Lamp Starting Voltage	V_S	-	-	2550	V_{RMS}	(2), Ta = 0 ºC
		-	-	2350	V_{RMS}	(2), Ta = 25 ºC
Operating Frequency	F_o	40	60	80	KHz	(3)
Lamp Life Time	L_{BL}	-	50000	-	Hrs	(4)

4.2.2 INVERTER CHARACTERISTICS (Ta=25±2℃)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Consumption	P_{BL}	-	315	330	W	(5), I_L = 6.0mA
Power Supply Voltage	V_{BL}	22.8	24.0	25.2	V_{DC}	
Power Supply Current	I_{BL}	-	13.13	13.75	A	Non Dimming
Input Ripple Noise	-	-	-	500	mV_{P-P}	V_{BL}=22.8V
Oscillating Frequency	F_W	47	50	53	kHz	
Dimming frequency	F_B	150	160	180	Hz	
Minimum Duty Ratio	D_{MIN}	-	20	-	%	

Note (1) Lamp current is measured by utilizing high frequency current meters as shown below:

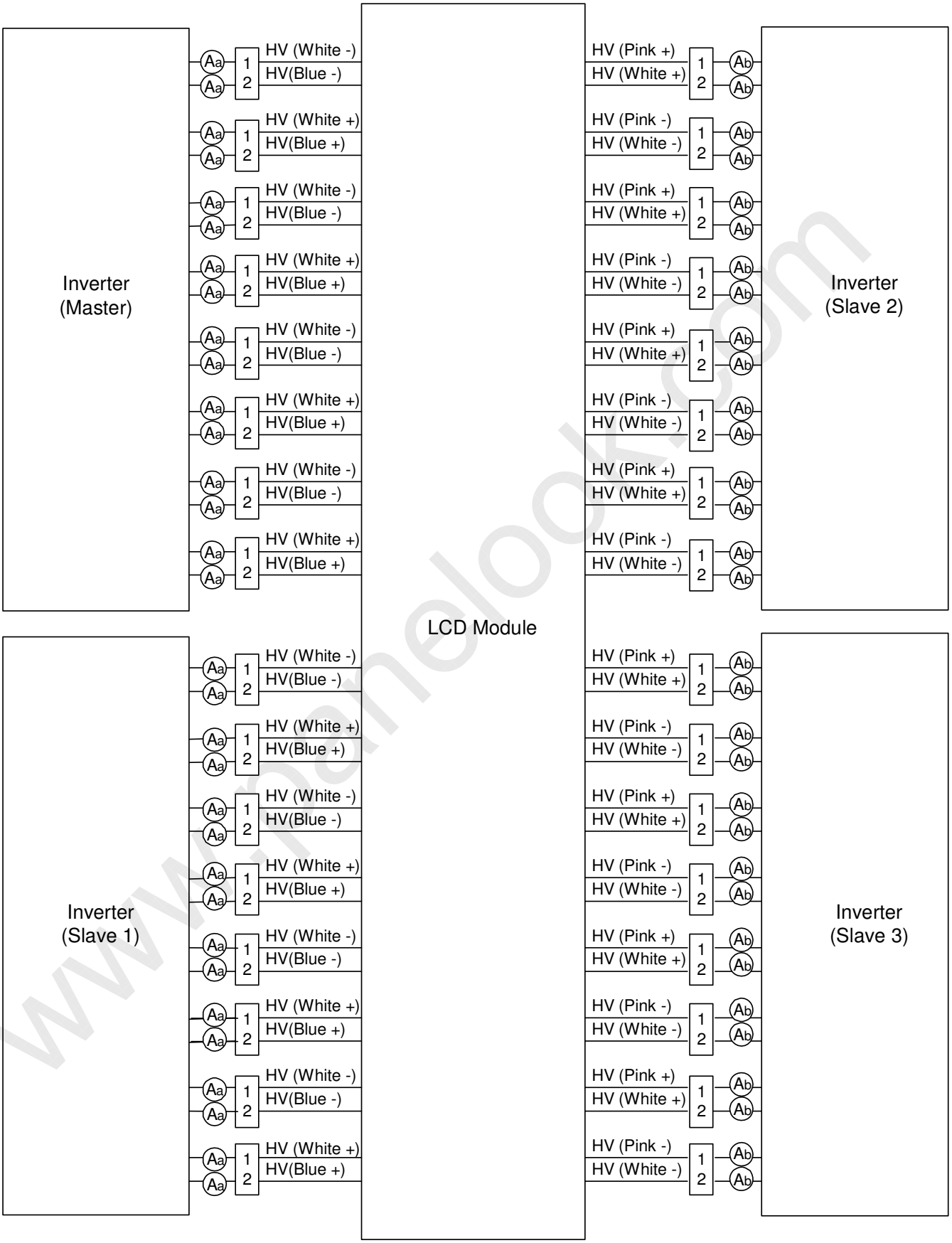
Note (2) The lamp starting voltage V_S should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

Note (3) The lamp frequency may produce interference with horizontal synchronous frequency of the display input signals, and it may result in line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.

Note (4) The life time of a lamp is defined as when the brightness is larger than 50% of its original value and the effective discharge length is longer than 80% of its original length (Effective discharge length is defined as an area that has equal to or more than 70% brightness compared to the brightness at the center point of lamp.) as the time in which it continues to operate under the condition at Ta = 25 ±2℃ and I_L = 5.5 ~ 6.5mA rms.

Note (5) The power supply capacity should be higher than the total inverter power consumption P_{BL}. Since the pulse width modulation (PWM) mode was applied for backlight dimming, the driving current changed as PWM duty on and off. The transient response of power supply should be considered for the changing loading when inverter dimming.

Note (6) The measurement condition of Max. value is based on 56" backlight unit under input voltage 24V , average lamp current 6.3 mA and lighting 30 minutes later.



4.2.3 INVERTER INTERTFACE CHARACTERISTICS

Parameter		Symbol	Test Condition	Value			Unit	Note
				Min.	Typ.	Max.		
On/Off Control Voltage	ON	V_{BLON}	—	2.0	—	5.0	V	
	OFF		—	0	—	0.8	V	
Internal/External PWM Select Voltage	HI	V_{SEL}	—	2.0	—-	5.0	V	
	LO		—	0	—	0.8	V	
Internal PWM Control Voltage	MAX	V_{IPWM}	V_{SEL} = L	3.15	3.3	3.45	V	Note (5)
	MIN			—	0	—	V	minimum duty ratio
External PWM Control Voltage	HI	V_{EPWM}	V_{SEL} = H	2.0	—	5.0	V	duty on
	LO			0	—	0.8	V	duty off
VBL Rising Time		Tr1	-	30	-	50	ms	
VBL Falling Time		Tf1	-	30	-	50	ms	
Control Signal Rising Time		Tr	—	—	—	100	ms	
Control Signal Falling Time		Tf	—	—	—	100	ms	
PWM Signal Rising Time		T_{PWMR}	—	—	—	50	us	
PWM Signal Falling Time		T_{PWMF}	—	—	—	50	us	
Input impedance		R_{IN}	—	1	—	—	MΩ	
PWM Delay Time		T_{PWM}	—	100		300	mS	
BLON Delay Time		T_{on}	—	300	—	500	ms	
BLON Off Time		T_{off}	—	300	—	500	ms	

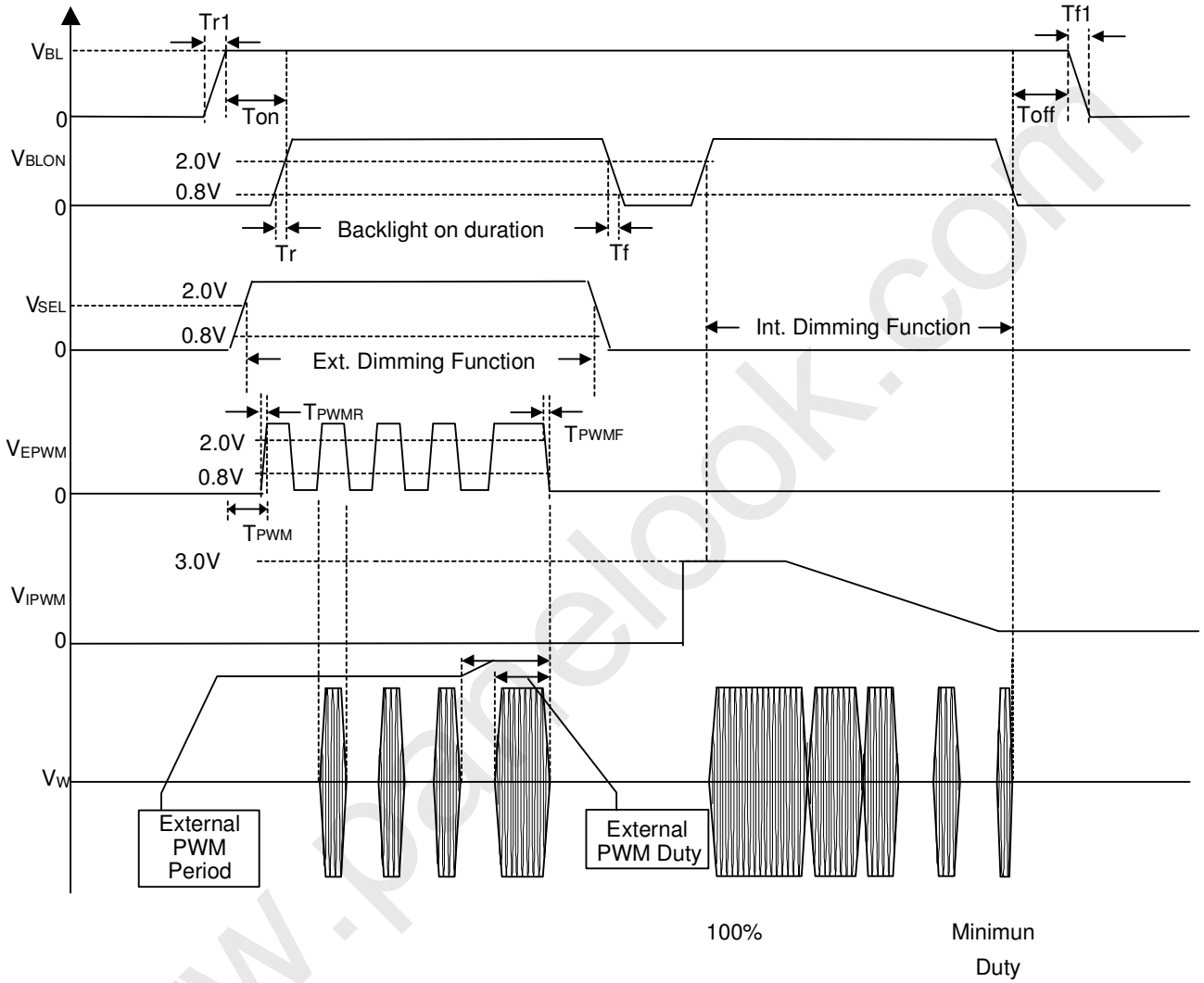
Note (1) The SEL signal should be valid before backlight turns on by BLON signal. It is inhibited to change the internal/external PWM selection (SEL) during backlight turn on period.

Note (2) The power sequence and control signal timing are shown in the following figure.

Note (3) The power sequence and control signal timing must follow the figure below. For a certain reason, the inverter has a possibility to be damaged with wrong power sequence and control signal timing.

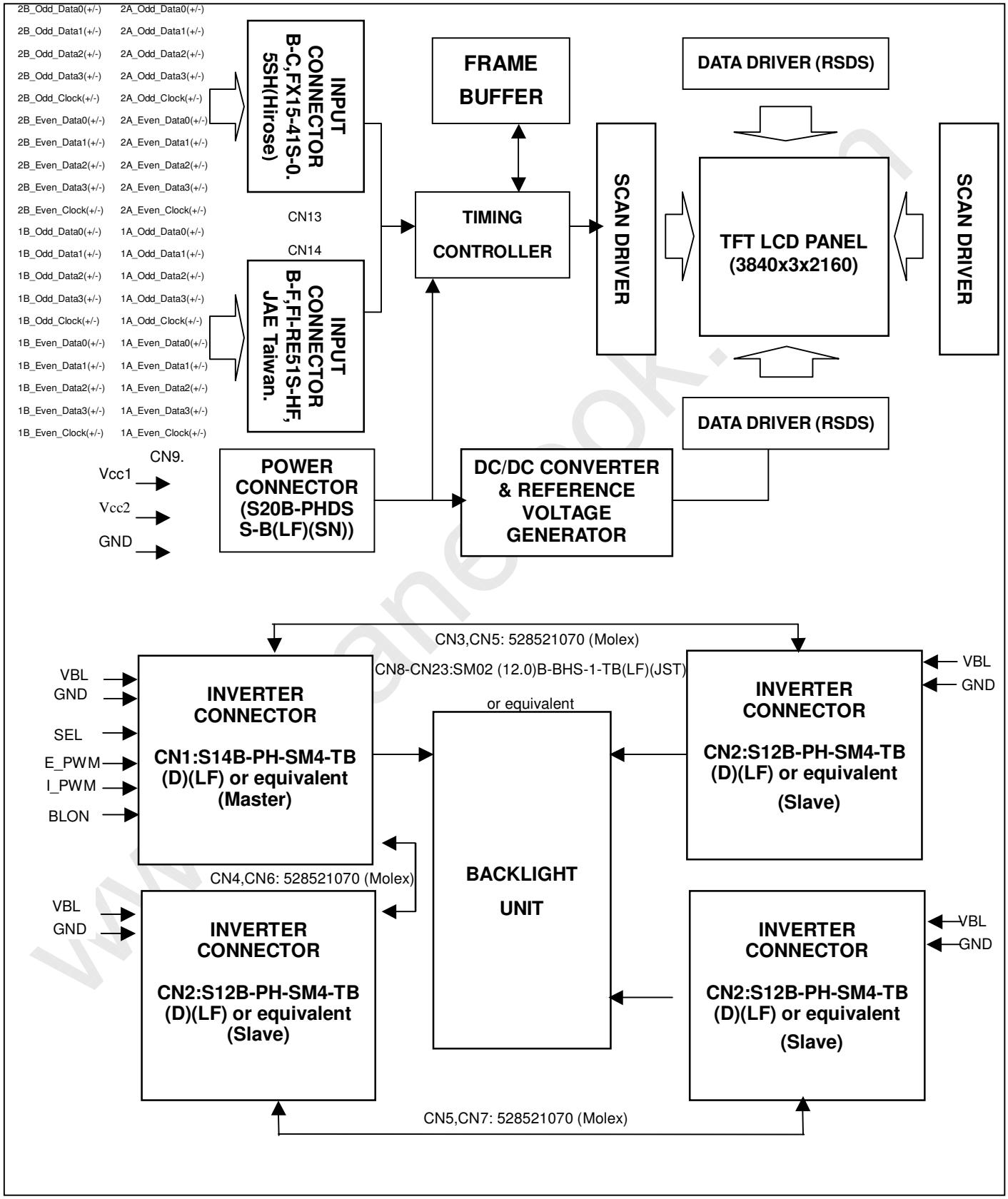
Note (4) Abnormal operation may occur if these maximum values of control signal are exceeded.

Note (5) The range of V_{IPWM} for dimming brightness should be constrained from 0V to 2.85V (i.e., 2.85V is the start dimming point) except the Max. value of V_{IPWM} mentioned here is only for the maximum brightness useful. In other words, 2.85V~3.15V is not suggested for using to prevent from possibly abnormal phenomenon.



5. BLOCK DIAGRAM

5.1 TFT LCD MODULE



6. LCD INPUT TERMINAL PIN ASSIGNMENT

6.1 TFT LCD MODULE L.V.D.S. INPUT

CN13 Connector Pin Assignment

Pin No.	Name	Description	Note
1	2B_ORX3+	Positive transmission data of Odd pixel 3.	
2	2B_ORX3-	Negative transmission data of Odd pixel 3.	
3	2B_ OCLK +	Positive of Odd clock.	
4	2B_ OCLK-	Negative of Odd clock.	
5	2B_ORX2+	Positive transmission data of Odd pixel 2.	
6	2B_ORX2-	Negative transmission data of Odd pixel 2.	
7	2B_ORX1+	Positive transmission data of Odd pixel 1.	
8	2B_ORX1-	Negative transmission data of Odd pixel 1.	
9	2B_ORX0+	Positive transmission data of Odd pixel 0.	
10	2B_ORX0-	Negative transmission data of Odd pixel 0.	
11	2B_ERX0-	Negative transmission data of Even pixel 0.	
12	2B_ERX0+	Positive transmission data of Even pixel 0.	
13	2B_ERX1-	Negative transmission data of Even pixel 1.	
14	2B_ERX1+	Positive transmission data of Even pixel 1.	
15	2B_ERX2-	Negative transmission data of Even pixel 2.	
16	2B_ERX2+	Positive transmission data of Even pixel 2.	
17	2B_ ECLK-	Negative of Even clock.	
18	2B_ ECLK+	Positive of Even clock.	
19	2B_ERX3-	Negative transmission data of Even pixel 3.	
20	2B_ERX3+	Positive transmission data of Even pixel 3.	
21	GND	Ground.	
22	2A_ORX0-	Negative transmission data of Odd pixel 0.	
23	2A_ORX0+	Positive transmission data of Odd pixel 0.	
24	2A_ORX1-	Negative transmission data of Odd pixel 1.	
25	2A_ORX1+	Positive transmission data of Odd pixel 1.	
26	2A_ORX2-	Negative transmission data of Odd pixel 2.	
27	2A_ORX2+	Positive transmission data of Odd pixel 2.	
28	2A_ OCLK-	Negative of Odd clock.	
29	2A_ OCLK+	Positive of Odd clock.	
30	2A_ORX3-	Negative transmission data of Odd pixel 3.	
31	2A_ORX3+	Positive transmission data of Odd pixel 3.	
32	2A_ERX3+	Positive transmission data of Even pixel 3.	

33	2A_ERX3-	Negative transmission data of Even pixel 3.	
34	2A_ ECLK+	Positive of Even clock.	
35	2A_ ECLK-	Negative of Even clock.	
36	2A_ERX2+	Positive transmission data of Even pixel 2.	
37	2A_ERX2-	Negative transmission data of Even pixel 2.	
38	2A_ERX1+	Positive transmission data of Even pixel 1.	
39	2A_ERX1-	Negative transmission data of Even pixel 1.	
40	2A_ERX0+	Positive transmission data of Even pixel 0.	
41	2A_ERX0-	Negative transmission data of Even pixel 0.	

CN14 Connector Pin Assignment

Pin No.	Name	Description	Note
1	NC	Not connect	
2	NC	Not connect	
3	ODSEL	Overdrive Lookup Table Selection	(3)
4	NC	Not connect	
5	NC	Not connect	
6	NC	Not connect	
7	NC	Not connect	
8	NC	Not connect	
9	GND	Ground.	
10	1B_ORX3+	Positive transmission data of Odd pixel 3.	
11	1B_ORX3-	Negative transmission data of Odd pixel 3.	
12	1B_ OCLK +	Positive of Odd clock.	
13	1B_ OCLK-	Negative of Odd clock.	
14	1B_ORX2+	Positive transmission data of Odd pixel 2.	
15	1B_ORX2-	Negative transmission data of Odd pixel 2.	
16	1B_ORX1+	Positive transmission data of Odd pixel 1.	
17	1B_ORX1-	Negative transmission data of Odd pixel 1.	
18	1B_ORX0+	Positive transmission data of Odd pixel 0.	
19	1B_ORX0-	Negative transmission data of Odd pixel 0.	
20	1B_ERX0-	Negative transmission data of Even pixel 0.	
21	1B_ERX0+	Positive transmission data of Even pixel 0.	
22	1B_ERX1-	Negative transmission data of Even pixel 1.	
23	1B_ERX1+	Positive transmission data of Even pixel 1.	
24	1B_ERX2-	Negative transmission data of Even pixel 2.	

25	1B_ERX2+	Positive transmission data of Even pixel 2.	
26	1B_ ECLK-	Negative of Even clock.	
27	1B_ ECLK+	Positive of Even clock.	
28	1B_ERX3-	Negative transmission data of Even pixel 3.	
29	1B_ERX3+	Positive transmission data of Even pixel 3.	
30	GND	Ground.	
31	1A_ORX0-	Negative transmission data of Odd pixel 0.	
32	1A_ORX0+	Positive transmission data of Odd pixel 0.	
33	1A_ORX1-	Negative transmission data of Odd pixel 1.	
34	1A_ORX1+	Positive transmission data of Odd pixel 1.	
35	1A_ORX2-	Negative transmission data of Odd pixel 2.	
36	1A_ORX2+	Positive transmission data of Odd pixel 2.	
37	1A_ OCLK-	Negative of Odd clock.	
38	1A_ OCLK+	Positive of Odd clock.	
39	1A_ORX3-	Negative transmission data of Odd pixel 3.	
40	1A_ORX3+	Positive transmission data of Odd pixel 3.	
41	1A_ERX3+	Positive transmission data of Even pixel 3.	
42	1A_ERX3-	Negative transmission data of Even pixel 3.	
43	1A_ ECLK+	Positive of Even clock.	
44	1A_ ECLK-	Negative of Even clock.	
45	1A_ERX2+	Positive transmission data of Even pixel 2.	
46	1A_ERX2-	Negative transmission data of Even pixel 2.	
47	1A_ERX1+	Positive transmission data of Even pixel 1.	
48	1A_ERX1-	Negative transmission data of Even pixel 1.	
49	1A_ERX0+	Positive transmission data of Even pixel 0.	
50	1A_ERX0-	Negative transmission data of Even pixel 0.	
51	GND	Ground.	

Note: (1) CN13 connector part no.: B-C,FX15-41S-0.5SH,Hirose electric.

(2) CN14 connector part no.: B-F,FI-RE51S-HF,JAE Taiwan.

(3) ODSEL (Overdrive Lookup Table Selection). The overdrive lookup table should be selected in accordance to the frame rate to optimize image quality.

ODSEL	Note
L	Lookup table was optimized for 60Hz frame rate.
H	Lookup table was optimized for 50Hz frame rate.

(4) “L” and “H” operation in (3) could follow “CMOS Interface” in Section 4.1

6.2 TFT LCD MODULE POWER INPUT

CN9 Connector Pin Assignment

Pin No.	Symbol	Description	Note
1	VIN	+18.0V power supply	
2	VIN	+18.0V power supply	
3	V5VC	+5.0V power supply	
4	V5VC	+5.0V power supply	
5	V5VC	+5.0V power supply	
6	NC	Not connection	
7	V5VC	+5.0V power supply	
8	NC	Not connection	
9	V5VC	+5.0V power supply	
10	NC	Not connection	(1)
11	GND	Ground	
12	NC	Not connection	
13	GND	Ground	
14	NC	Not connection	
15	GND	Ground	
16	NC	Not connection	
17	GND	Ground	
18	GND	Ground	
19	GND	Ground	
20	GND	Ground	

Note: (1) CN9 connector part no.: S20B-PHDSS-B(LF)(SN), JST(日本壓著端子),德通端子 or equivalent.

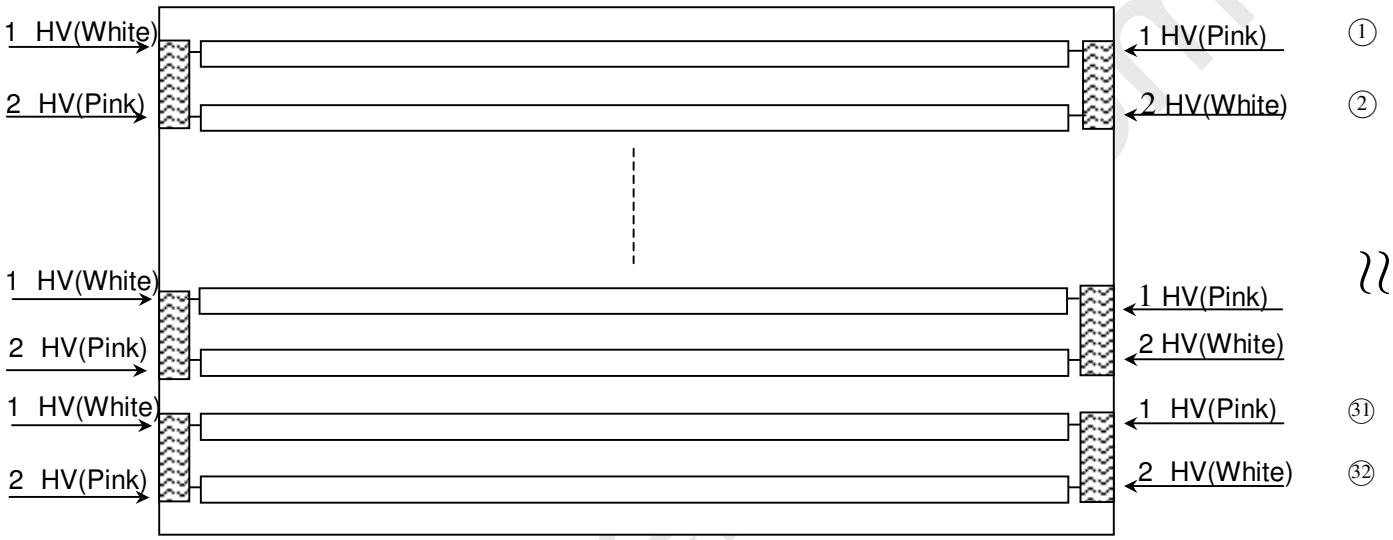
6.3 BACKLIGHT UNIT

The pin configuration for the housing and the leader wire is shown in the table below.

CN8-CN23: BHR-04VS-1 (JST).

Pin	Name	Description	Wire Color
1	HV	High Voltage	Pink
2	HV	High Voltage	White

Note (1) The backlight interface housing for high voltage side is a model BHR-04VS-1, manufactured by JST and the mating header on inverter part number is SM02 (12.0) B-BHS-1-TB (LF).



6.4 INVERTER UNIT

CN1 (Master, Header): S14B-PH-SM4-TB (D)(LF)(JST) or equivalent

Pin No.	Symbol	Description
1	VBL	+24V_{DC} power input
2		
3		
4		
5		
6	GND	GND
7		
8		
9		
10		
11	SEL	Internal/external PWM selection High : external dimming Low : internal dimming
12	E_PWM	External PWM control signal E_PWM should be connected to ground when internal PWM was selected (SEL = Low).
13	I_PWM	Internal PWM Control Signal I_PWM should be connected to ground when external PWM was selected (SEL = High).
14	BLON	Backlight on/off control

CN2 (Slave, Header): S12B-PH-SM4-TB (D)(LF)(JST) or equivalent

Pin No.	Symbol	Description
1	VBL	+24V_{DC} power input
2		
3		
4		
5		
6	GND	GND
7		
8		
9		
10		
11	NC	NC
12	NC	NC

CN8-CN15 (Master, Header), CN16-CN23 (Slave, Header): SM02 (12.0) B-BHS-1-TB (LF)(JST) or equivalent

Pin No.	Symbol	Description
1	CCFL HOT	CCFL high voltage
2	CCFL HOT	CCFL high voltage

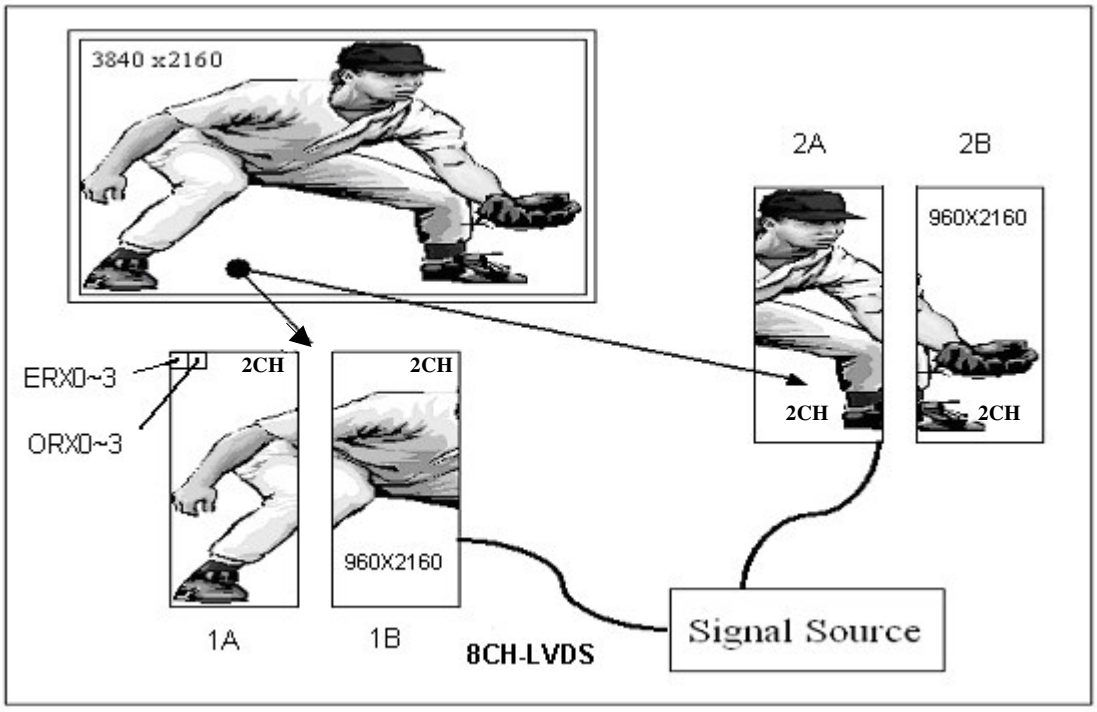
CN3-CN4 (Master, Header), CN5-CN7 (Slave, Header): 528521070 (Molex)

Pin No.	Symbol	Description
1	Control Signal	Board to Board
2		Board to Board
3		Board to Board
4		Board to Board
5		Board to Board
6		Board to Board
7		Board to Board
8		Board to Board
9		Board to Board
10		Board to Board

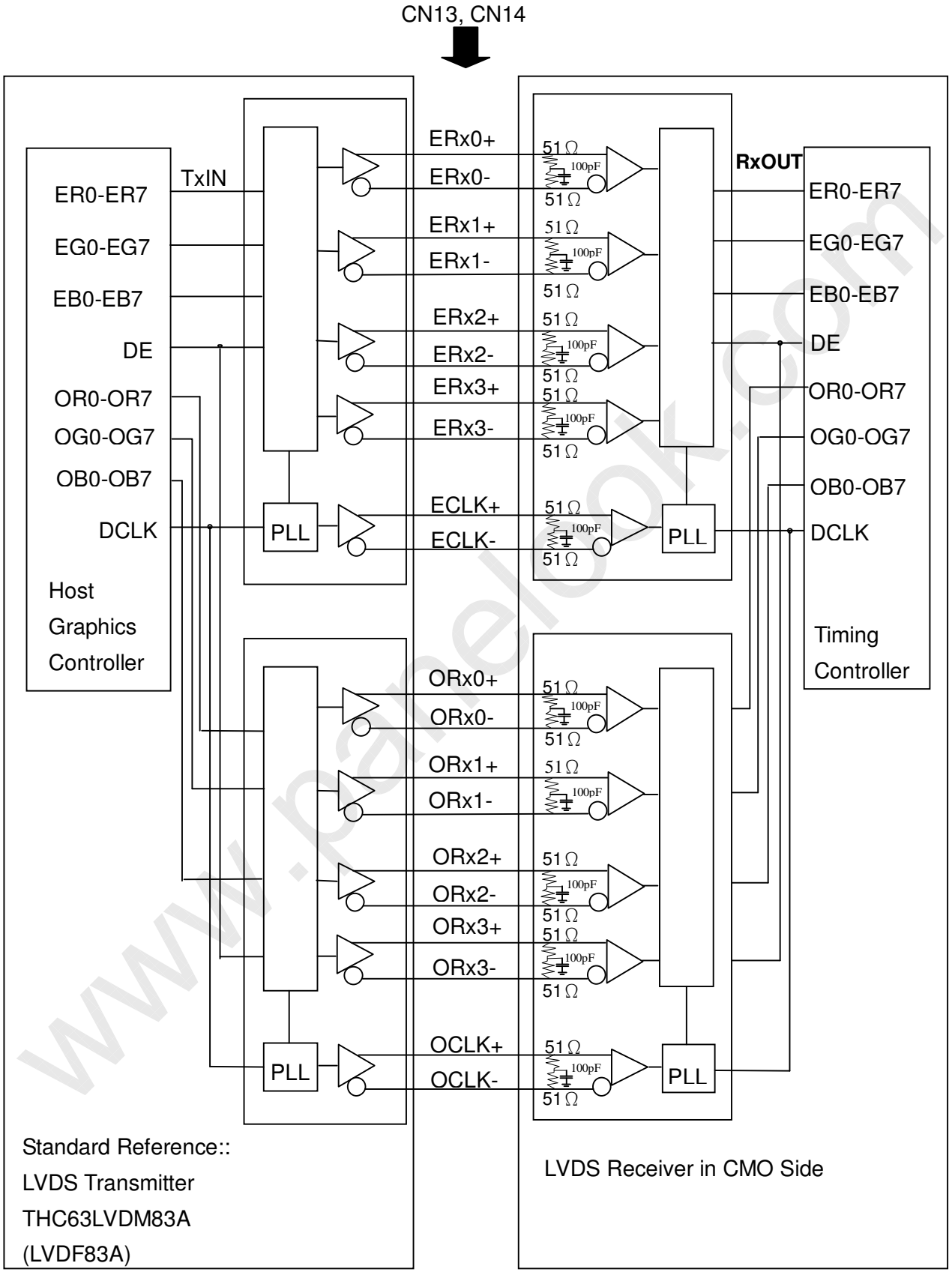
Note (1) Floating of any control signal is not allowed.

6.5 BLOCK DIAGRAM OF IMAGE SIGNAL

The video picture (3840x2160) should be divided into four parts: each one is 960x2160 resolution. Signals of these four parts should be delivered into the module individually through each 2-channel LVDS interface. But it must be “synchronous” mutually between signals from these four 2-channel LVDS interfaces. And the protocol is specified in the LVDS interface specification.



6.6 BLOCK DIAGRAM OF NORMAL L.V.D.S.



ER0~ER7 : Even pixel R data
EG0~EG7 : Even pixel G data
EB0~EB7 : Even pixel B data
OR0~OR7 : Odd pixel R data
OG0~OG7: Odd pixel G data
OB0~OB7 : Odd pixel B data
DE : Data enable signal
DCLK : Data clock signal

Notes: (1) The driving system must have the transmitter to drive the module.
(2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.
(3) Two pixel data are sent into the module for every clock cycle. The first pixel of the frame is even pixel and the second pixel is odd pixel.

6.7 L.V.D.S. INTERFACE DEFINITION

	SIGNAL	TRANSMITTER THC63LVDM83A		INTERFACE CONNECTOR		RECEIVER THC63LVDF84A		TFT CONTROL INPUT
		PIN	INPUT	Host	TFT-LCD	PIN	OUTPUT	
24bit	R0	51	TxIN0			27	Rx OUT0	R0
	R1	52	TxIN1			29	Rx OUT1	R1
	R2	54	TxIN2	TA OUT0+	Rx 0+	30	Rx OUT2	R2
	R3	55	TxIN3			32	Rx OUT3	R3
	R4	56	TxIN4			33	Rx OUT4	R4
	R5	3	TxIN6	TA OUT0-	Rx 0-	35	Rx OUT6	R5
	G0	4	TxIN7			37	Rx OUT7	G0
	G1	6	TxIN8			38	Rx OUT8	G1
	G2	7	TxIN9			39	Rx OUT9	G2
	G3	11	TxIN12	TA OUT1+	Rx 1+	43	Rx OUT12	G3
	G4	12	TxIN13			45	Rx OUT13	G4
	G5	14	TxIN14			46	Rx OUT14	G5
	B0	15	TxIN15	TA OUT1-	Rx 1-	47	Rx OUT15	B0
	B1	19	TxIN18			51	Rx OUT18	B1
	B2	20	TxIN19			53	Rx OUT19	B2
	B3	22	TxIN20			54	Rx OUT20	B3
	B4	23	TxIN21	TA OUT2+	Rx 2+	55	Rx OUT21	B4
	B5	24	TxIN22			1	Rx OUT22	B5
	DE	30	TxIN26			6	Rx OUT26	DE
	R6	50	TxIN27	TA OUT2-	Rx 2-	7	Rx OUT27	R6
	R7	2	TxIN5			34	Rx OUT5	R7
	G6	8	TxIN10			41	Rx OUT10	G6
	G7	10	TxIN11			42	Rx OUT11	G7
	B6	16	TxIN16	TA OUT3+	Rx 3+	49	Rx OUT16	B6
	B7	18	TxIN17			50	Rx OUT17	B7
	RSVD 1	25	TxIN23			2	Rx OUT23	Not connect
	RSVD 2	27	TxIN24	TA OUT3-	Rx 3-	3	Rx OUT24	Not connect
	RSVD 3	28	TxIN25			5	Rx OUT25	Not connect
	DCLK	31	TxCLK IN	TxCLK OUT+ TxCLK OUT-	RxCLK IN+ RxCLK IN-	26	RxCLK OUT	DCLK

R0~R7: Pixel R Data (7; MSB, 0; LSB)

G0~G7: Pixel G Data (7; MSB, 0; LSB)

B0~B7: Pixel B Data (7; MSB, 0; LSB)

DE : Data enable signal

DCLK : Data clock signal

Notes (1) RSVD(reserved)pins on the transmitter shall be “H” or “L”.

6.8 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input the brighter the color. The table below provides the assignment of color versus data input. Note (1) 0: Low Level Voltage, 1: High Level Voltage

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

7. TIMING REQUIREMENTS OF IMAGE SIGNAL

7.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Receiver Clock (1-CH LVDS)	Frequency	1/Tc	60	72	72	MHz	(4)
	Input cycle to cycle jitter	Trcl	-	-	200	ps	
LVDS Receiver Data	Setup Time	Tlvsu	600	-	-	ps	
	Hold Time	Tlvhd	600	-	-	ps	
Vertical Active Display Term (2-CH LVDS,960x 2160 Active Area)	Frame Rate	Fr5	47	50	53	Hz	(2)
		Fr6	57	60	63	Hz	(3)
	Total	Tv	2164	2164	2300	Th	Tv=Tvd+Tvb
	Display	Tvd	-	2160	-	Th	
	Blank	Tvb	4	4	140	Th	
Horizontal Active Display Term (2-CH LVDS,960x 2160 Active Area)	Total	Th	1100	1100	1175	Tc	Th=Thd+Thb
	Display	Thd	-	960	-	Tc	
	Blank	Thb	140	140	215	Tc	

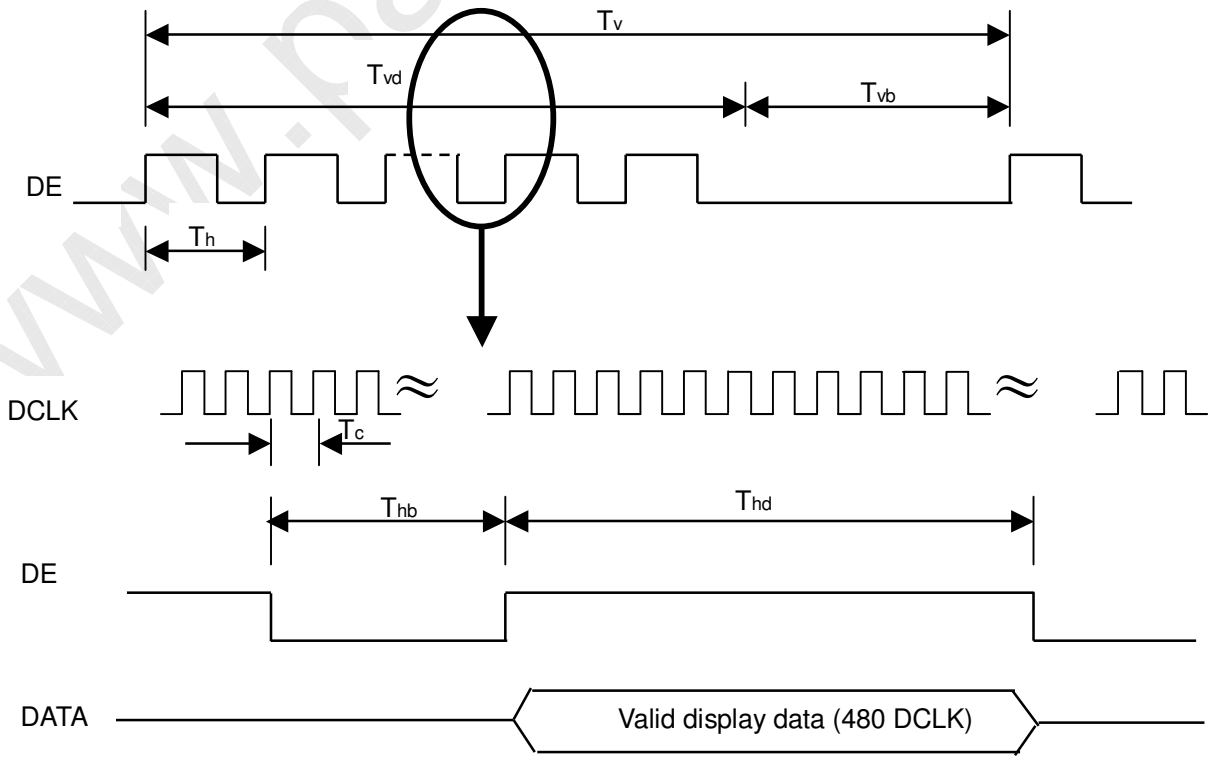
Note: (1) Since this module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this module would operate abnormally.

(2) (ODSEL) = (H). Please refer to Section 6.1 for detail information.

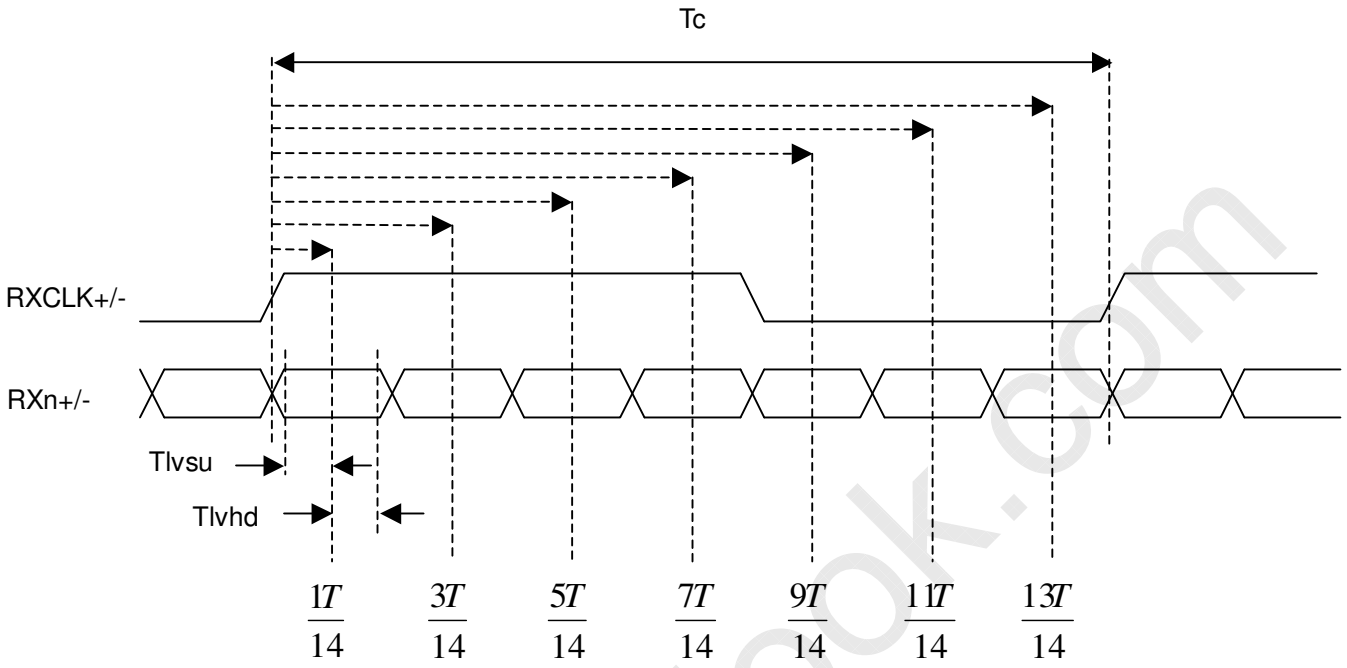
(3) (ODSEL) = (L). Please refer to Section 6.1 for detail information.

(4) The value of Typ. is based on 60Hz operation.

INPUT SIGNAL TIMING DIAGRAM

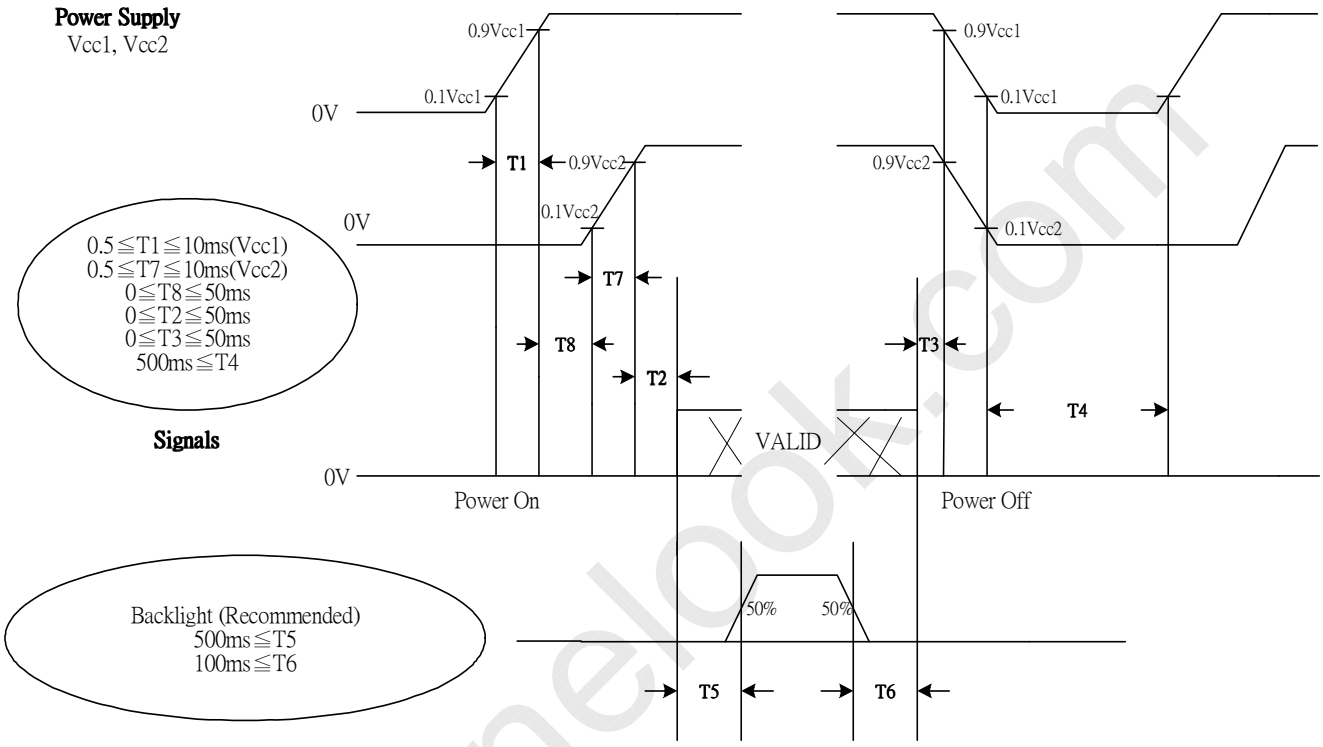


LVDS RECEIVER TIMING DIAGRAM



7.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be followed as the diagram below.



Power ON/OFF Sequence

Note : (1) The supplied voltage of the external system for the module input should follow the definition of Vcc1,2.

(2) Apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

(3) In case of Vcc1,2 is in off level, please keep the level of input signals on the low and avoid floating.

(4) T4 should be measured after the module being fully discharged between power off and on period.

(5) Interface signal shall not be kept at high impedance when the power is on.

8. OPTICAL CHARACTERISTICS

8.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	I_L	6.0±0.5	mA
Oscillating Frequency (Inverter)	F_L	50±3	KHz
Frame Rate	F_r	60	Hz

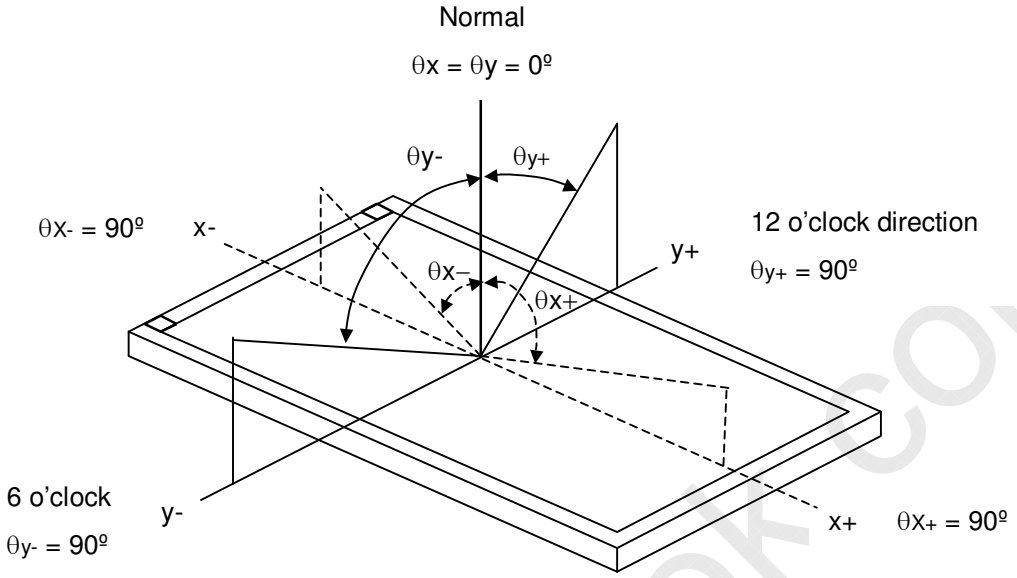
8.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 8.2 Notes. The following items should be measured under the test conditions described in 8.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_x=0°, θ_Y =0° Viewing angle at normal direction	900	1200		-	Note (2)
Response Time		Gray to gray			6.5		ms	Note (3)
Center Luminance of White		L_C		400	450		cd/m^2	Note (4)
Average Luminance of White		L_{AVE}		400	450	-	cd/m^2	Note (4)
White Variation		δW				1.6	-	Note (7)
Cross Talk		CT				2	%	Note (5)
Color Chromaticity	Red	Rx		Typ. -0.03	0.651	Typ. +0.03	-	Note (6)
		Ry			0.332		-	
	Green	Gx			0.269		-	
		Gy			0.593		-	
	Blue	Bx			0.144		-	
		By			0.060		-	
	White	Wx			0.285		-	
		Wy			0.293		-	
	Color Gamut	C.G		72	75		%	NTSC
Viewing Angle	Horizontal	θ_x+	CR≥30	80	88		Deg.	Note (1)
		θ_x-		80	88			
	Vertical	θ_Y+		80	88			
		θ_Y-		80	88			

Note (1) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by Eldim EZ-Contrast 160R



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

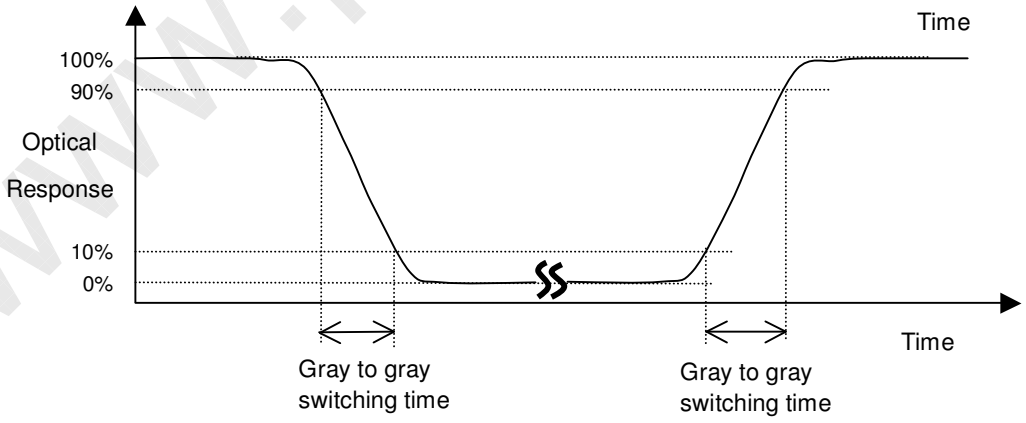
Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (7), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (7).

Note (3) Definition of Gray to Gray Switching Time:



The driving signal means the signal of gray level 0, 63, 127, 191, 255.

Gray to gray average time means the average switching time of gray level 0 ,63,127,191,255 to each other.

Note (4) Definition of Luminance of White (L_C, L_{AVE}):

Measure the luminance of gray level 255 at center point and 5 points

$L_C = L(7)$

$L_{AVE} = [L(4) + L(5) + L(7) + L(9) + L(10)] / 5$

Where L (x) is corresponding to the luminance of the point X at the figure in Note (7).

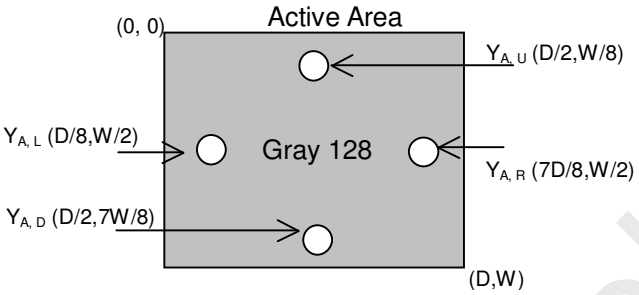
Note (5) Definition of Cross Talk (CT):

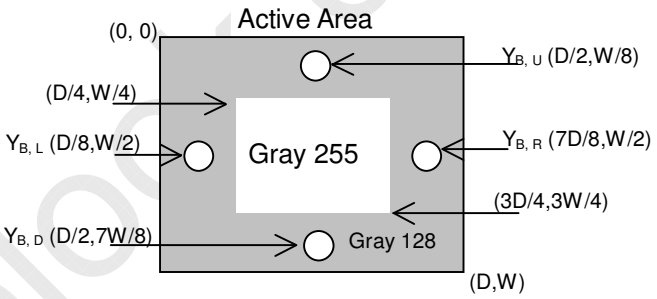
$CT = | Y_B - Y_A | / Y_A \times 100\ (\%)$

Where:

Y_A = Luminance of measured location without gray level 255 pattern (cd/m^2)

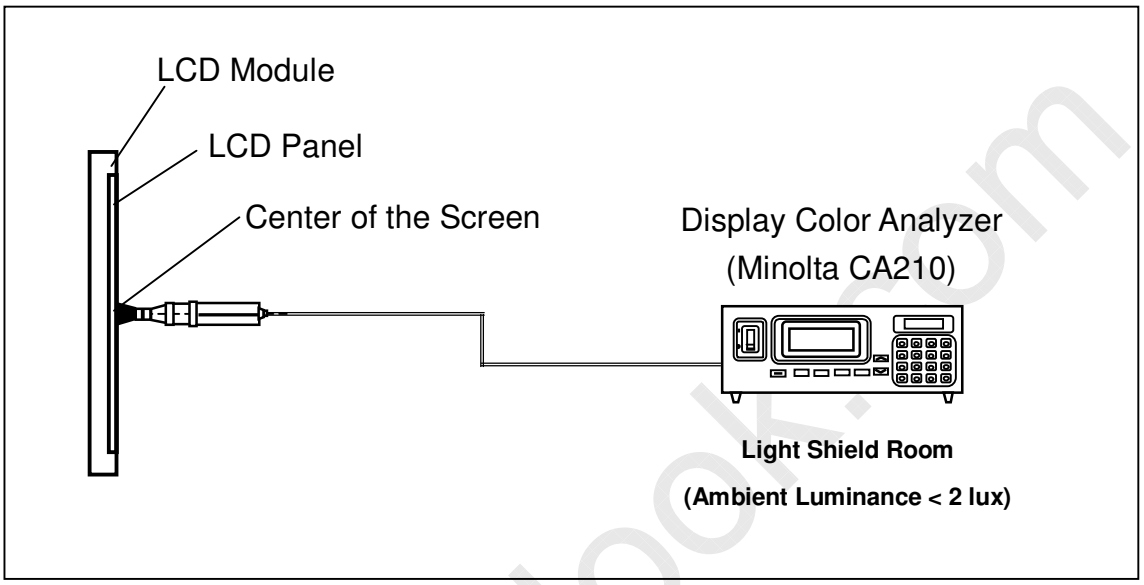
Y_B = Luminance of measured location with gray level 255 pattern (cd/m^2)





Note (6) Measurement Setup:

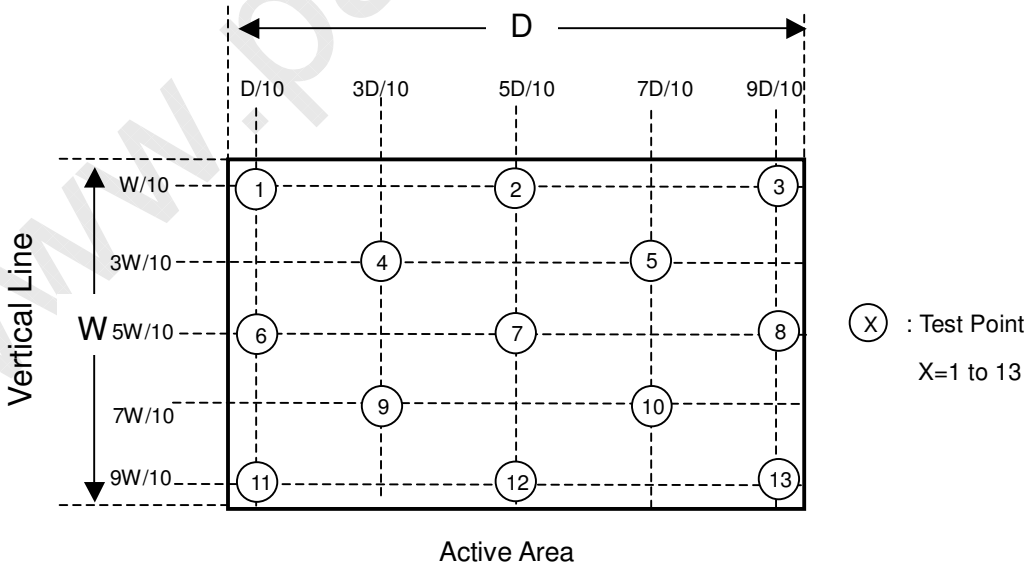
The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 1 hour in a windless room.



Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 128 at 13 points

δW = Maximum [L (1), L (2), L (3), L (4), 、、、, L (13)] / Minimum [L (1), L (2), L (3), L (4), 、、、, L (13)]



9. PRECAUTIONS

9.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) Do not apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.

(4) Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.

(5) Do not plug in or pull out the I/F connector while the module is in operation.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) Moisture can easily penetrate into LCD module and may cause the damage during operation.

(9) When storing modules as spares for a long time, the following precaution is necessary.

a. Do not leave the module in high temperature, and high humidity for a long time.It is highly recommended to store the module with temperature from 0 to 35℃at normal humidity without condensation.

b. The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

(10) When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.

9.2 SAFETY PRECAUTIONS

(1) The startup voltage of a Backlight is approximately 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the Backlight unit.

(2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(3) After the module's end of life, it is not harmful in case of normal operation and storage.

9.3 SAFETY STANDARDS

The LCD module should be certified with safety regulations as follows:

(1) UL60950-1 or updated standard.

(2) IEC60950-1 or updated standard.

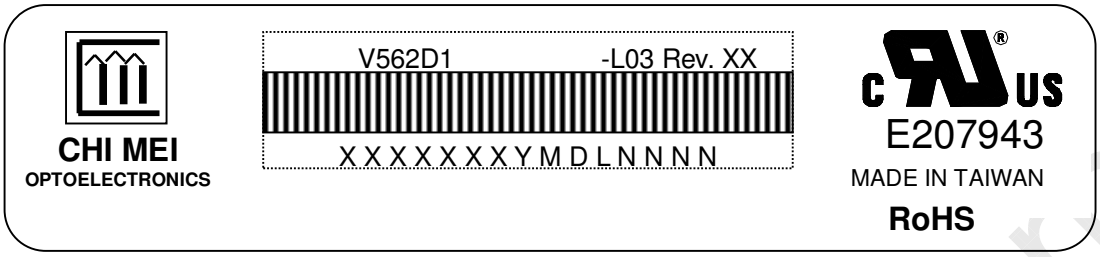
(3) UL60065 or updated standard.

(4) IEC60065 or updated standard.

10.DEFINITION OF LABELS

10.1 CMO MODULE LABEL

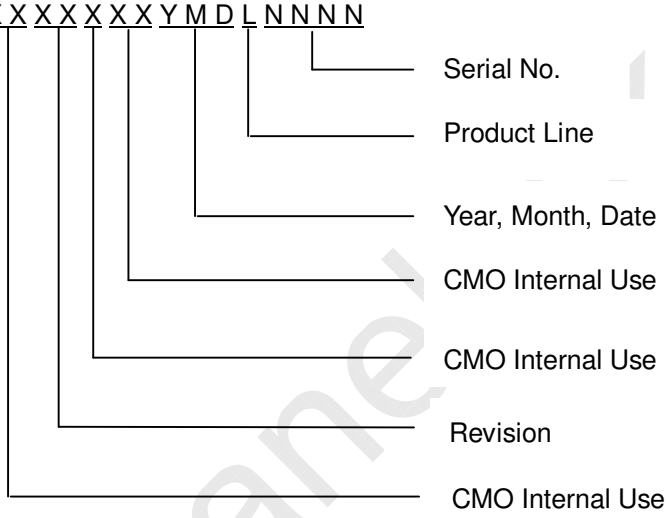
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: V562D1-L03

(b) Revision: Rev. XX, for example: A0, A1… B1, B2… or C1, C2…etc.

(c) Serial ID: X X X X X X X Y M D L N N N N



Serial ID includes the information as below:

(a) Manufactured Date: Year: 0~9, for 2000~2009
Month: 1~9, A~C, for Jan. ~ Dec.
Day: 1~9, A~Y, for 1st to 31st, exclude I ,O, and U.

(b) Revision Code: Cover all the change

(c) Serial No.: Manufacturing sequence of product

(d) Product Line: 1 -> Line1, 2 -> Line 2, …etc.

11. PACKAGE

11.1 PACKING SPECIFICATIONS

(1) 2 LCD TV modules / 1 Box

(2) Box dimensions : 1448(L) X 372 (W) X 901 (H)

(3) Weight : approximately 56Kg (2 modules per box)

(4) One protective film is attached on the LCD TV

11.2 PACKING METHOD

Figures 9-1 and 9-2 are the packing method

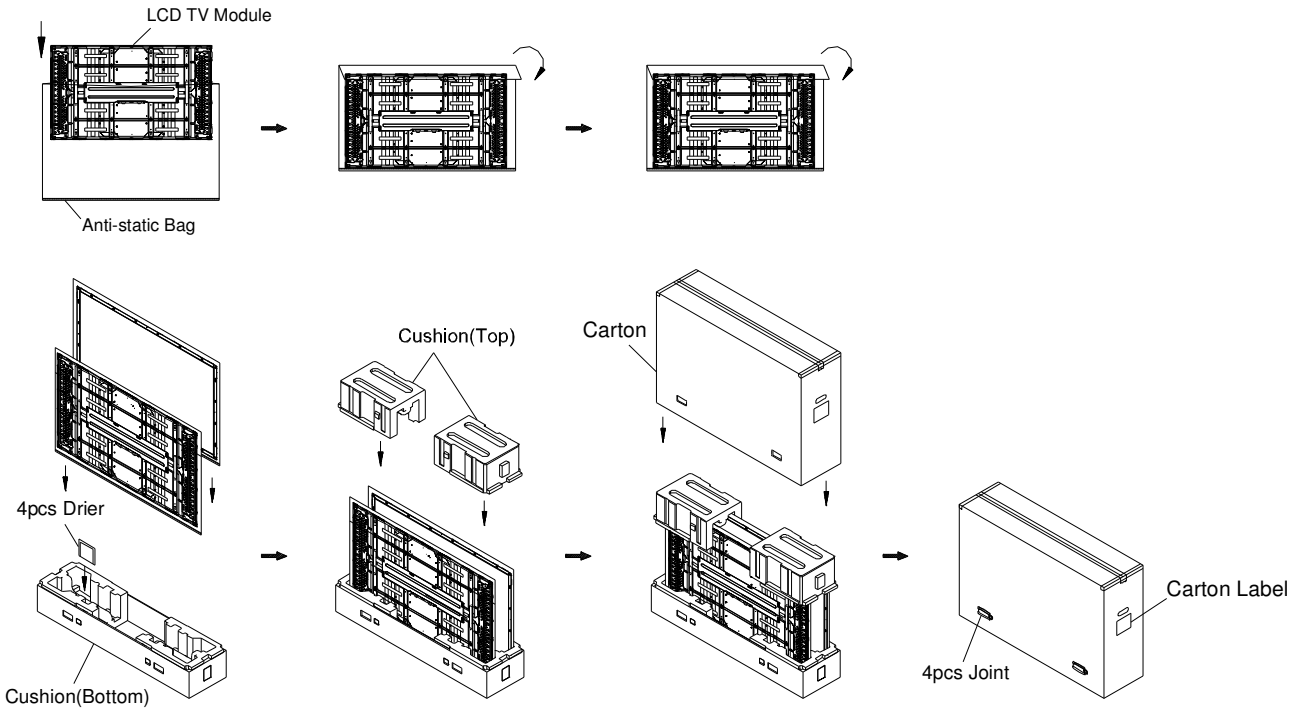
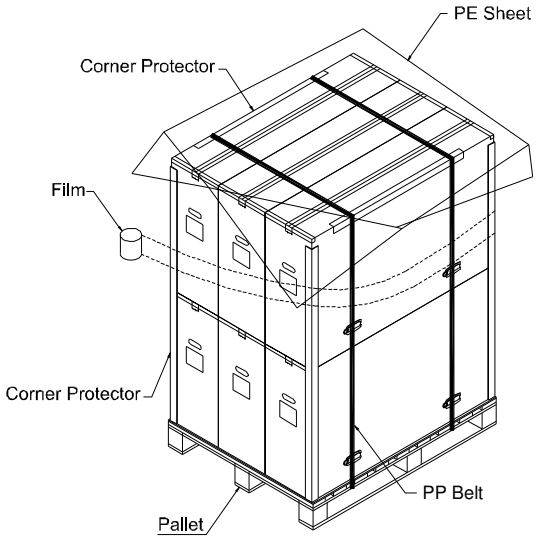


Figure.9-1 packing method

Sea Transportation

Corner Protector:L1780*50mm*50mm
Corner Protector:L1130*50mm*50mm
Pallet:L1150*W1460*H140mm
Pallet Stack:L1150*W1460*H1942mm
Gross:353kg



Air Transportation

Corner Protector:L800*50mm*50mm
Corner Protector:L1130*50mm*50mm
Pallet:L1150*W1460*H140mm
Pallet Stack:L1150*W1460*H1041mm
Gross:185kg

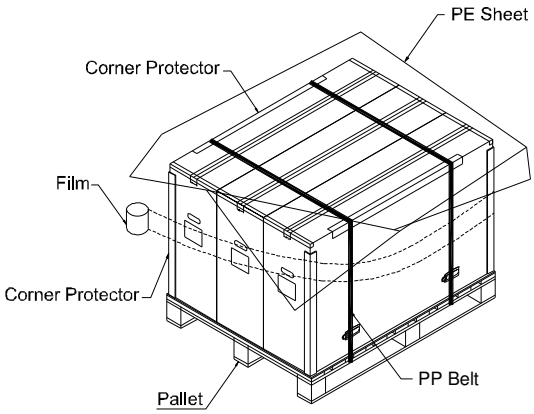


Figure. 9-2 Packing method

12. MECHANICAL CHARACTERISTIC